Weight Loss Maintenance: The National Weight Control Registry

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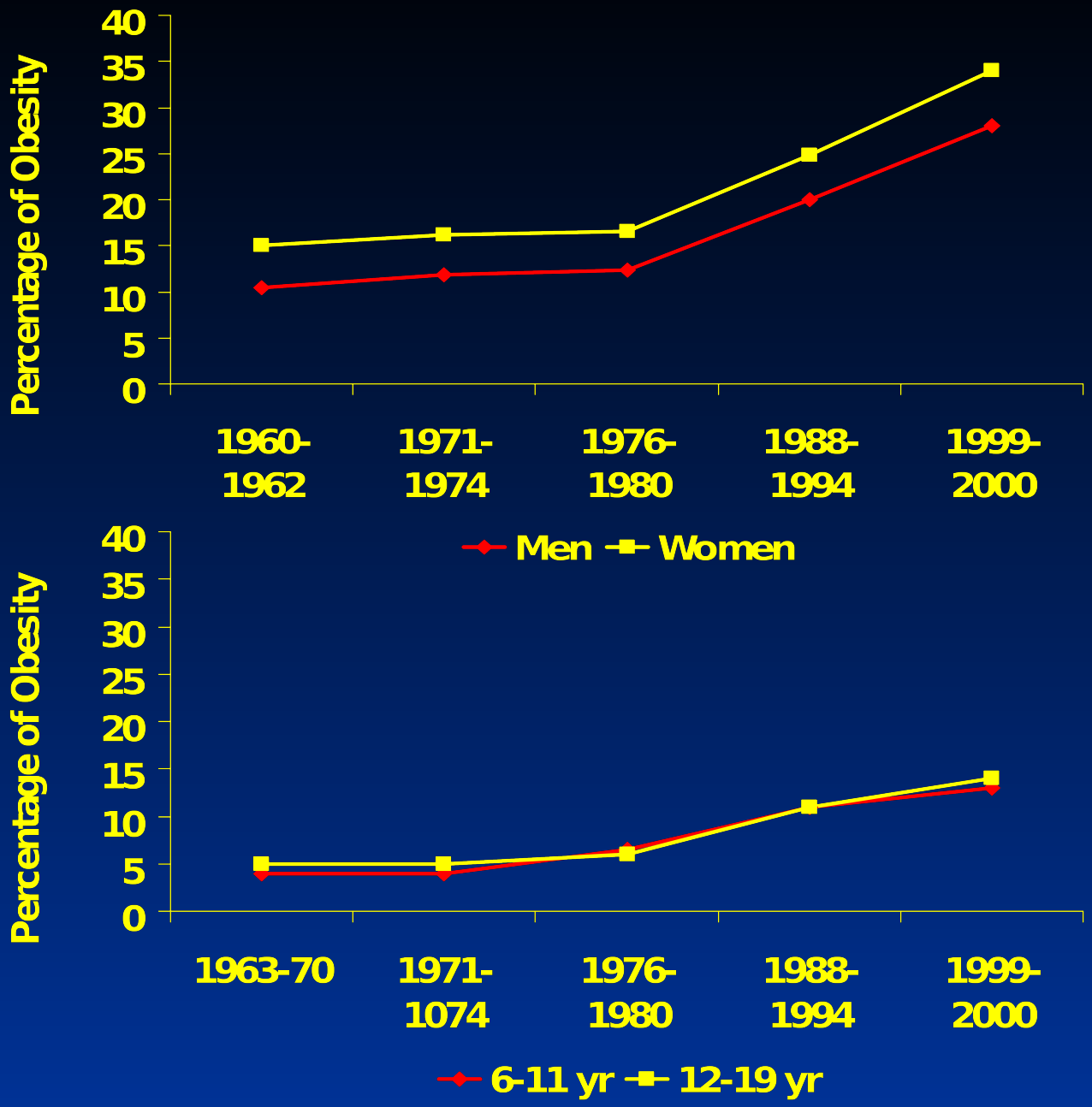
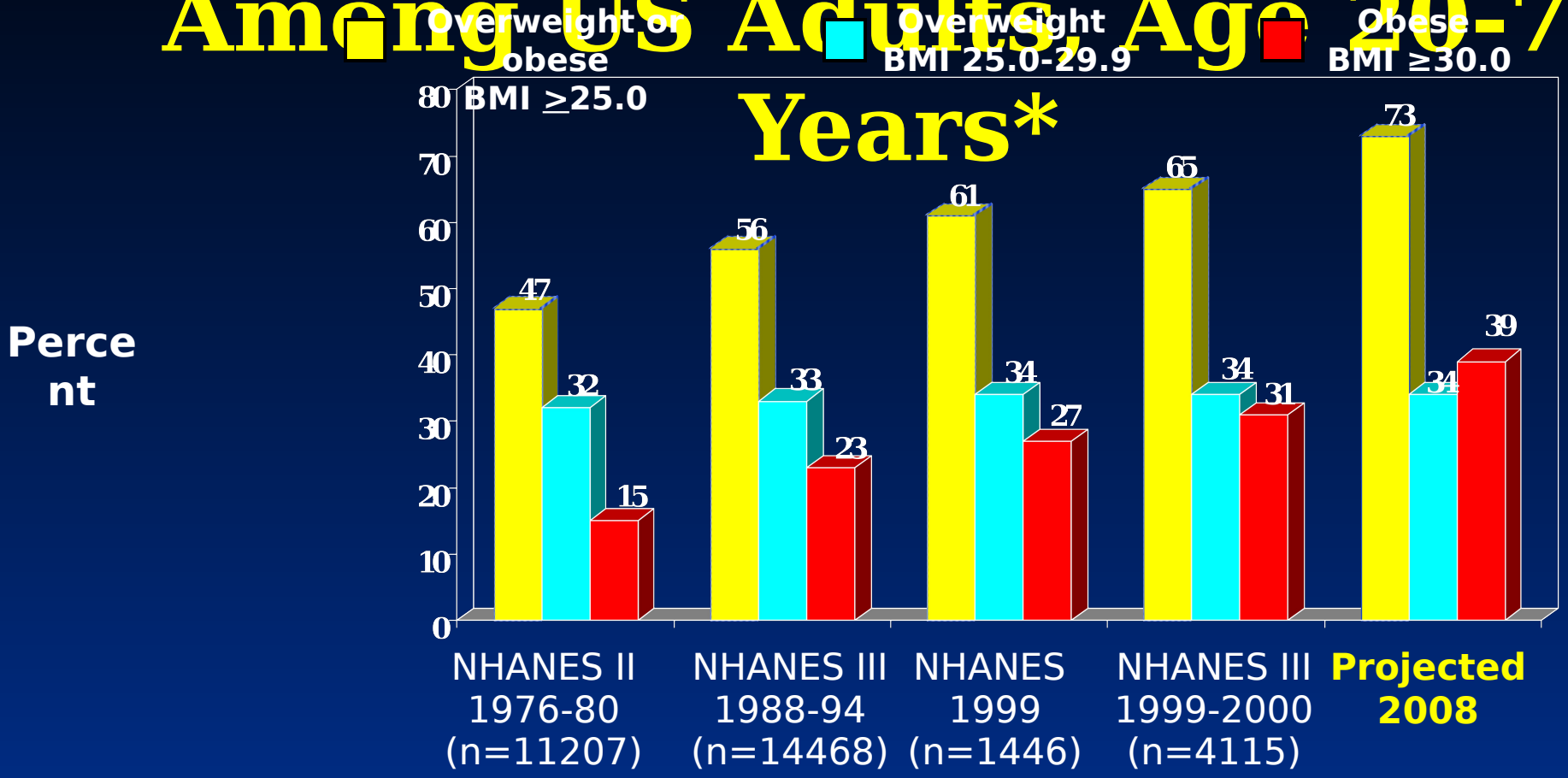

Percentage of Obesity
40
35
30
25
20
15
10
5
0
1960-1962
1971-1974
1976-1980
1988-1994
1999-2000
Men
Women
Percentage of Obesity
40
35
30
25
20
15
10
5
0
1963-70
1971-1074
1976-1980
1988-1994
1999-2000
6-11 yr
12-19 yr

Prevalence of Overweight and Obesity Among US Adults, Age 20-74 Years*



BMI = body mass index.

*Age-adjusted by the direct method to the year 2000 U.S. Bureau of the Census estimates using the age groups 20-34, 35-44, 45-54, 55-64, and 65-74 years.

Diets are always Big News

- The Atkins “craze” is over
- Most weight loss programs have no data; ones that do show only modest success
- People don’t stick with diets

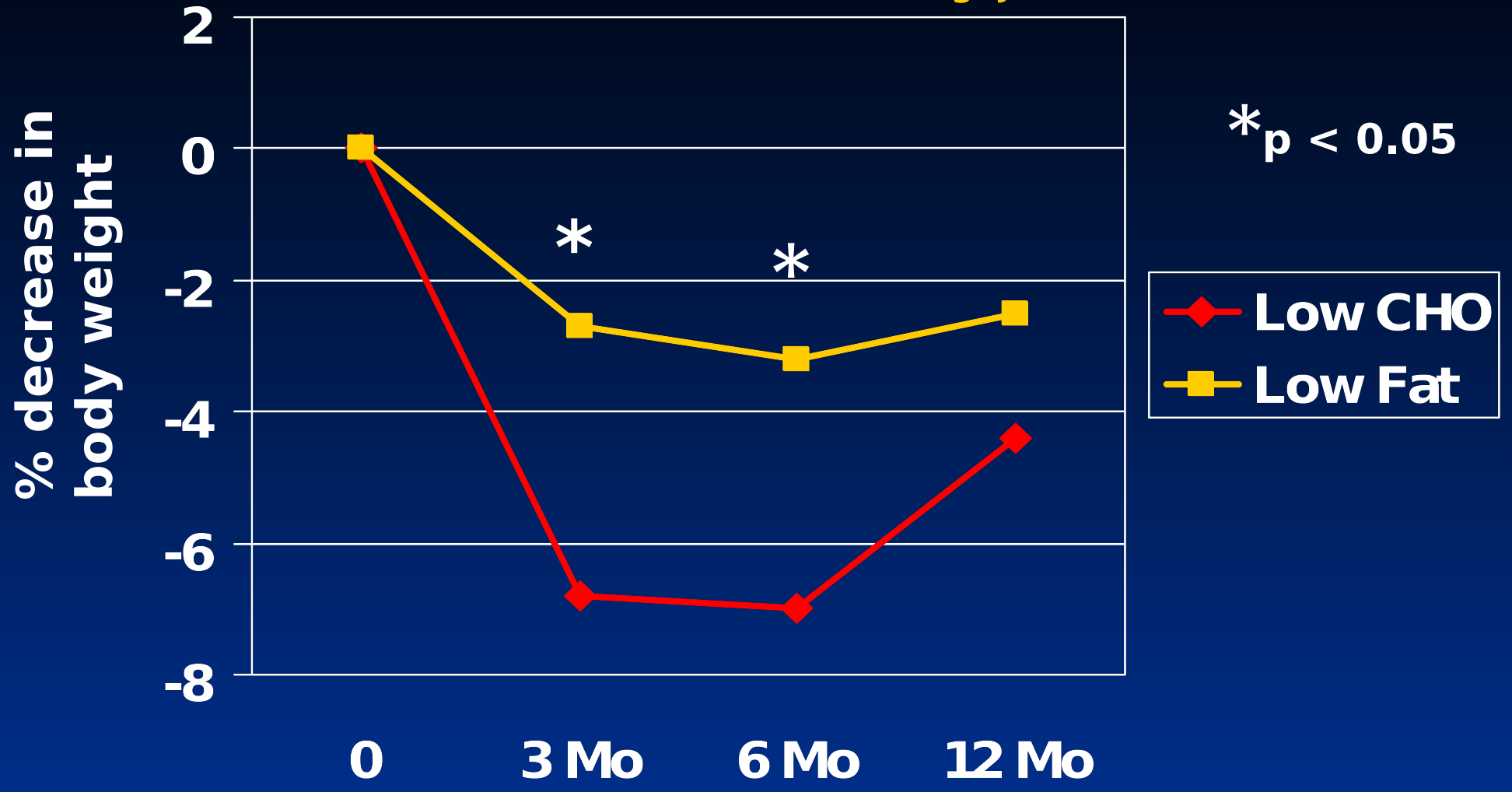
Why Don’t Diets Work?

- **Several studies have now shown that low carbohydrate diets do produce weight loss**

– why did this fad die?

Percent Changes in Body Weight on a Low CHO vs a Low Fat Diet at 3,6, and 12 months.

Foster et al. N Engl J Med 348, 2003



Why Don’t Diets Work?

It’s not a problem with low carb but with diets in general

What are we doing wrong?

Focusing on Weight Loss and not Maintenance of Weight loss

- Weight loss and maintenance of weight loss are different processes
- Food restriction drives weight loss
- Physical activity is key to weight loss maintenance

- **We are very successful in producing weight loss**
- **We are very unsuccessful in sustaining weight loss**

What do we know about weight loss maintenance?

- University based weight loss programs
- Qualitative studies of small groups of maintainers
- Short term weight maintenance

National Weight Control Registry (NWCR)

- Founded in 1994 by Drs James Hill and Rena Wing
- Registry of “successful losers”
- Minimum of 30 lbs of weight loss for a minimum of one year
- Over 6,000 participants

NWCR Purpose:

- to identify a large group of successful weight maintainers
- to use quantitative measures to describe weight loss and weight maintenance strategies
- to categorize groups within the larger sample
- to counterbalance the idea that everyone fails

Advantages of NWCR

- Large number of subjects
- Weight Maintenance for long-periods of time
- Variety of weight loss methods
- Ability to look at reduced-obese in subgroups
- Follow prospectively over time for weight gain

Who is in the NWCR?
Characteristics of Registry Members

	Women (80%)	Men (20%)	Total
Education	20.5%	9.7%	18.4%
White	97%	96%	97%
Married	68%	67%	67%
Age	44±11	49±11	45±11
Max BMI	35 ±7	37±9	35 ±7
Current BMI	24±4	26±4	25±4

Who is in the NWCR?
Characteristics of Registry Members

- Most of the registry had childhood onset obesity
  - 46% report being overweight by 11y of age
  - 25.3% report being overweight by 12-18y of age
  - 28.3% report being overweight by >18 y of age
- 46% report one parent was overweight
- 26.8% report both parents were overweight

How much weight did they lose?

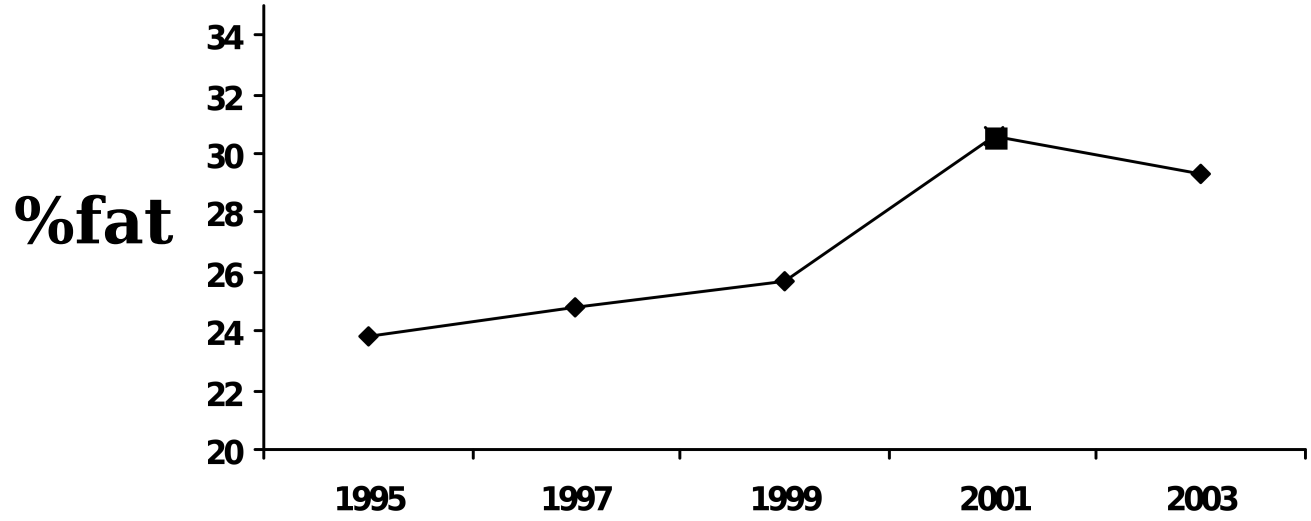
- On average 30 kg
  - 28.7 ± 13.6 kg in women
  - 35 ± 13.6 kg in men
- maintained the minimum wt loss (13.6kg) for 5.5 years
- 16% maintained the minimum weight loss for >10 years

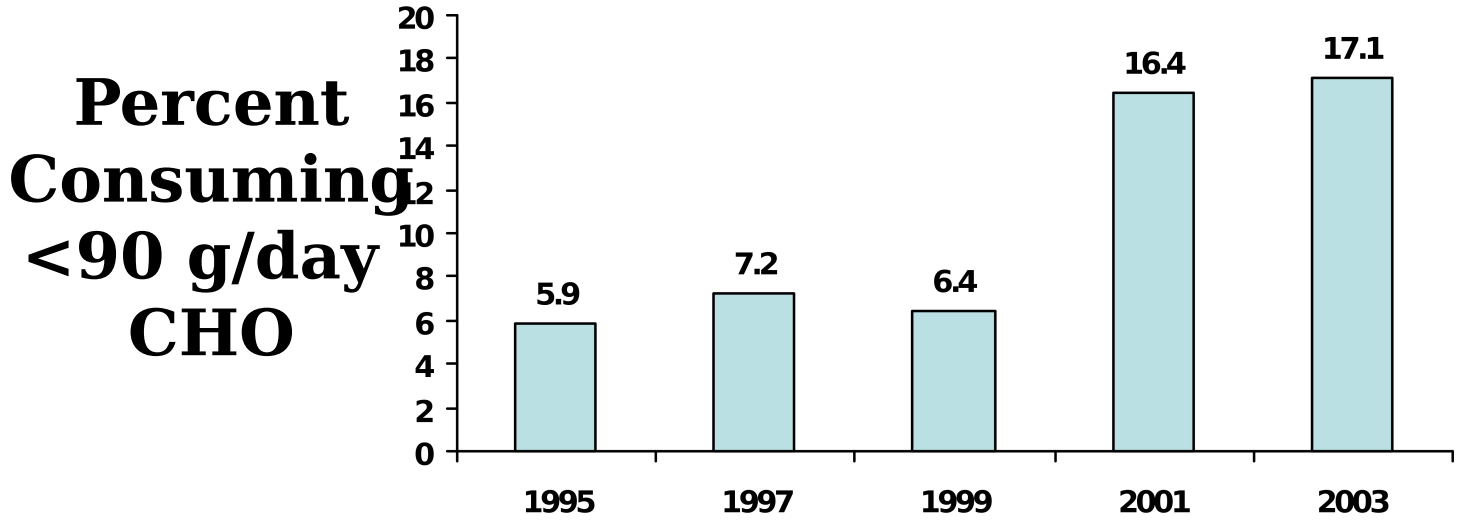
How did they lose weight?

- 89% reported both diet and physical activity
- 10% reported diet alone
- 1% reported exercise alone

NWCR: Weight Loss and Maintenance Strategies

- Great similarity in how weight is being maintained
  - Low fat diet but watching total calories
  - Frequent self monitoring
  - Regularly eating breakfast
  - High daily levels of physical activity

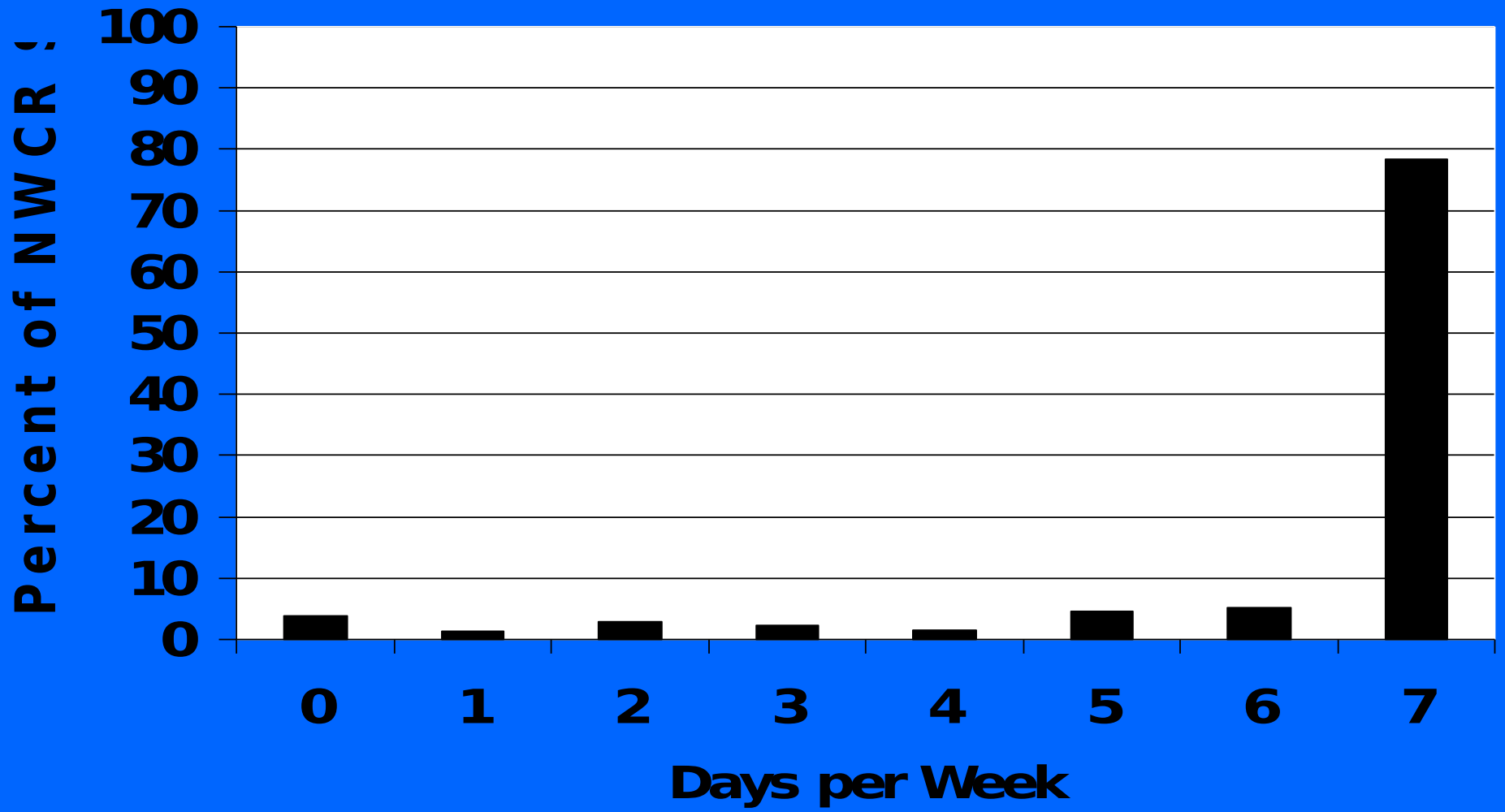

%fat
34
32
30
28
26
24
22
20
1995
1997
1999
2001
2003


Percent Consuming <90 g/day CHO
20
18
16
14
12
10
8
6
4
2
0
5.9
7.2
6.4
16.4
17.1
1995
1997
1999
2001
2003

Self Monitoring: NWCR

- 75% weigh more than once a week
- 44% weigh once a day
- 50% still count calories/fat grams

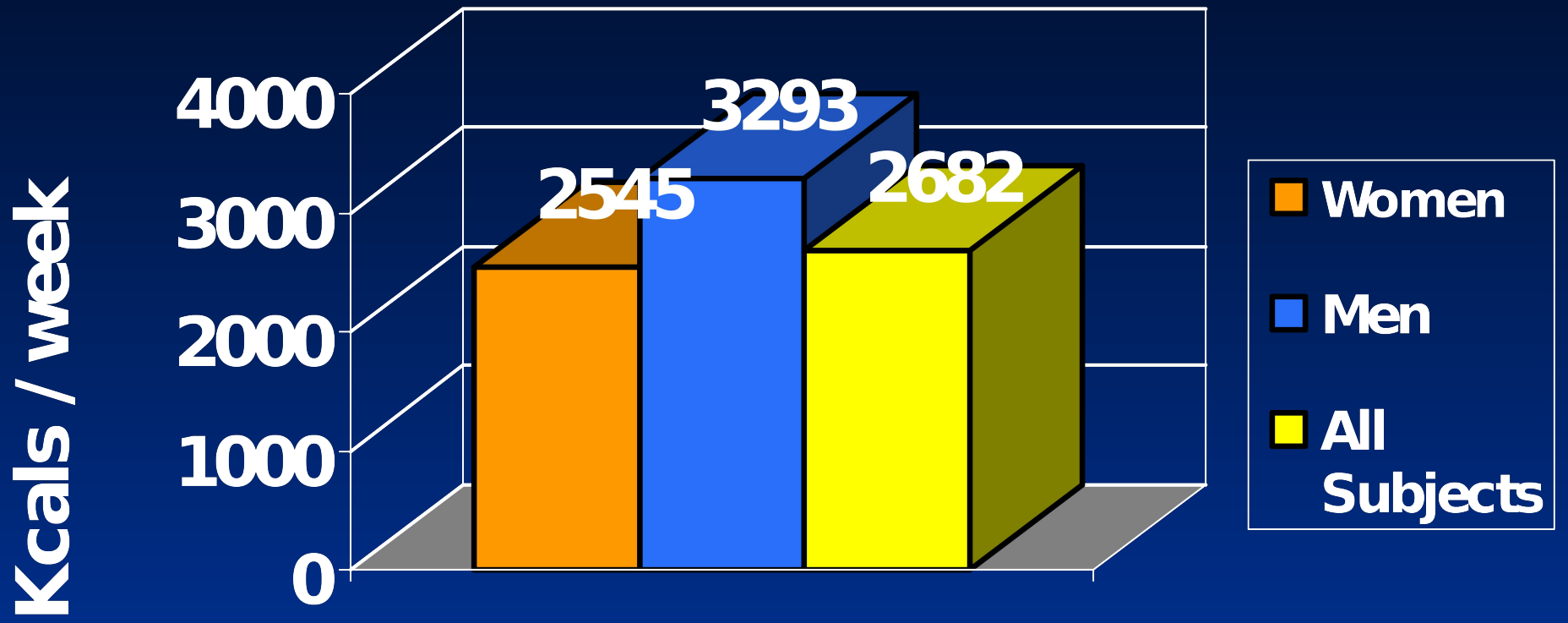
Figure 1:Frequency Distribution of Percentage of NWCR Subjects Reporting Eating Breakfast 0 to 7 Days per Week



Exercise Behaviors: NWCR

- Weekly exercise habits of 1047 NWCR Subjects
  - (196 men and 851 women)
- Paffenbarger Physical Activity Questionnaire
- Walking, Stair climbing, Recreational activities
- Frequency, duration, and intensity level

Average Energy Expended In Physical Activity In The NWCR



Classification of NWCR members into 4 exercise categories

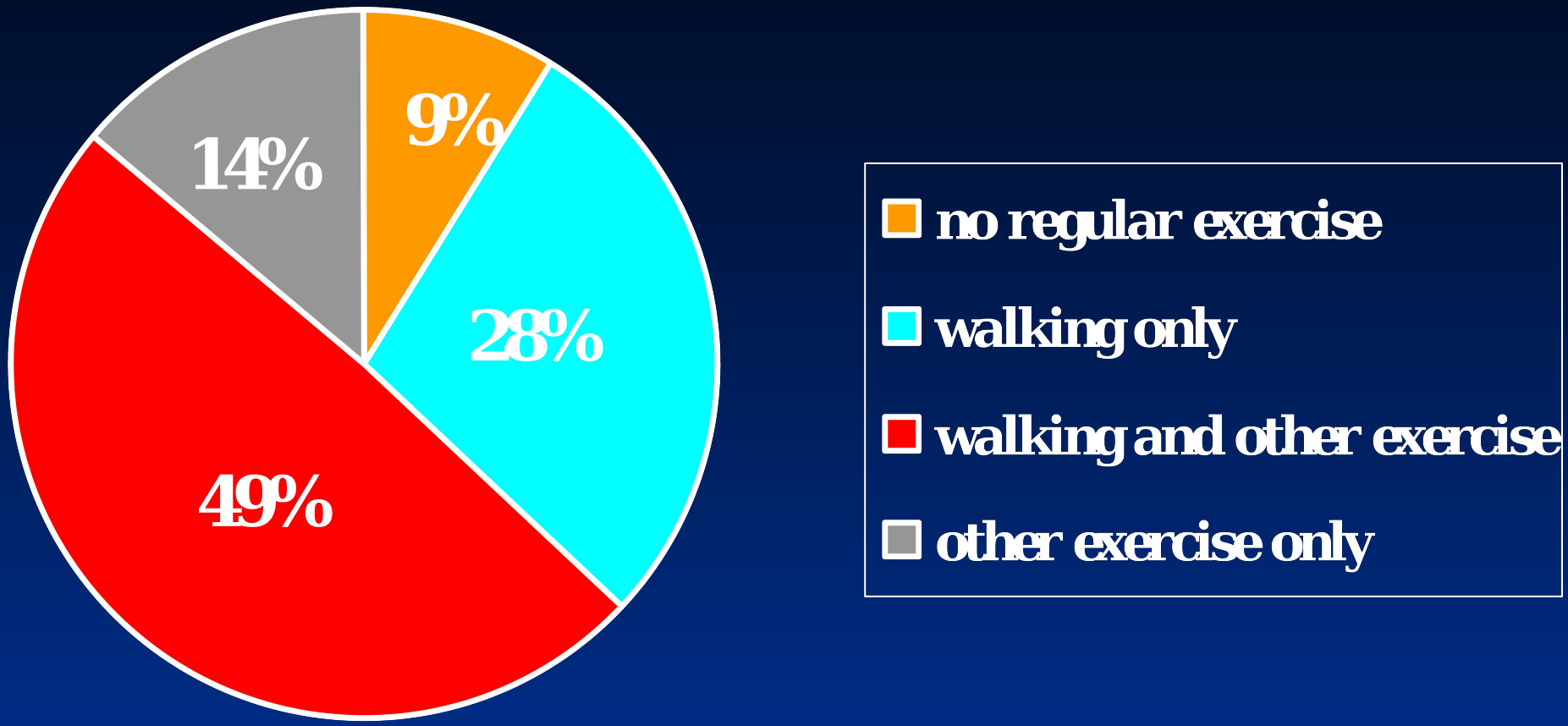


Table 1: Average Steps/day for NWCR and Non-reduced Subjects

	Steps/day Mean ± SD	Minimum Steps	Maximum Steps
NWCR	**11071 ± 4392**	**3817**	**20380**
Non-reduced	**5275 ± 3401** **P=0.0001**	**1769**	**11879**

Table 1: Activities Most Frequently Reported by the General Public[11]

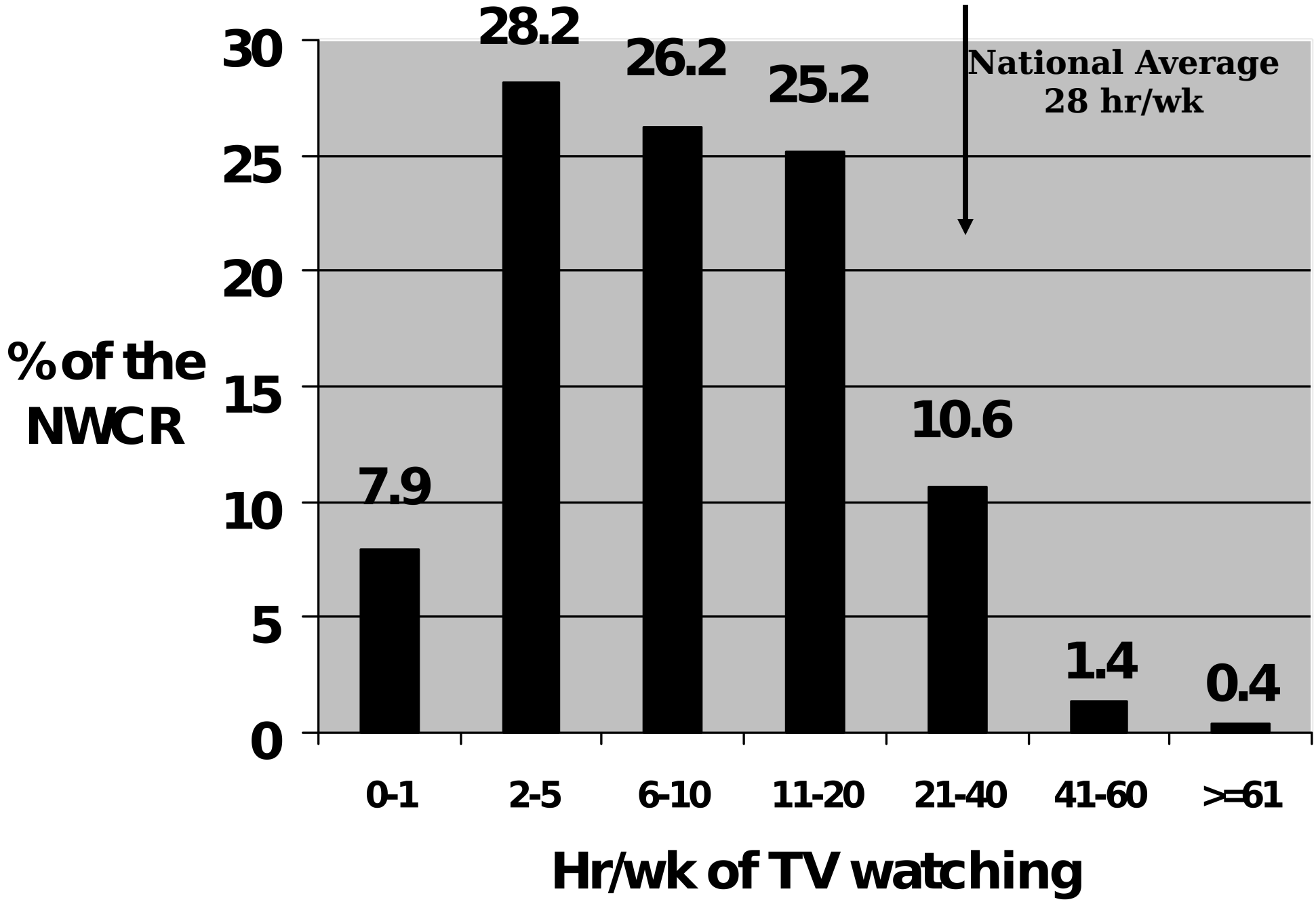
	NHIS		NWCR	
	Percentage Reporting Activity			
Activity	M	F	M	F
Walking	39.4%	48.3%	78.6%	76.1%
Running	12.8%	5.7%	20.4%	8.2%
Cycling	16.2%	14.6%	22.4%	20.2%
Aerobics	2.8%	11.1%	4.1%	20.9%
Stair climbing	9.9%	11.6%	3.1%	9.5%
Weight lifting	20.0%	8.8%	24.0%	19.5%

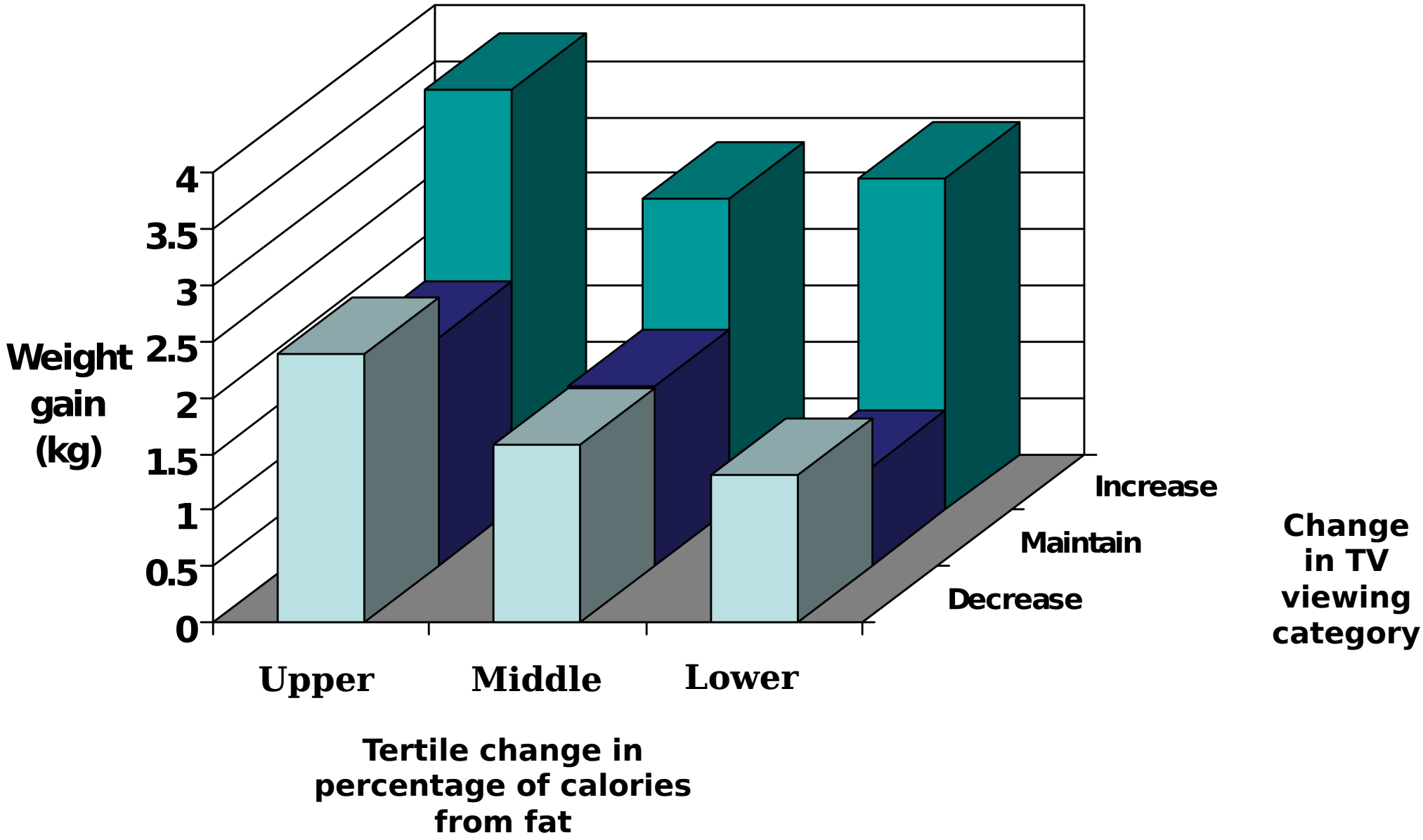
NHIS = National Health Interview Survey 1991
NWCR = National Weight Control Registry

Bray GA,Contemporary Diagnosis and Management of Obesity 1998

Weight Regain

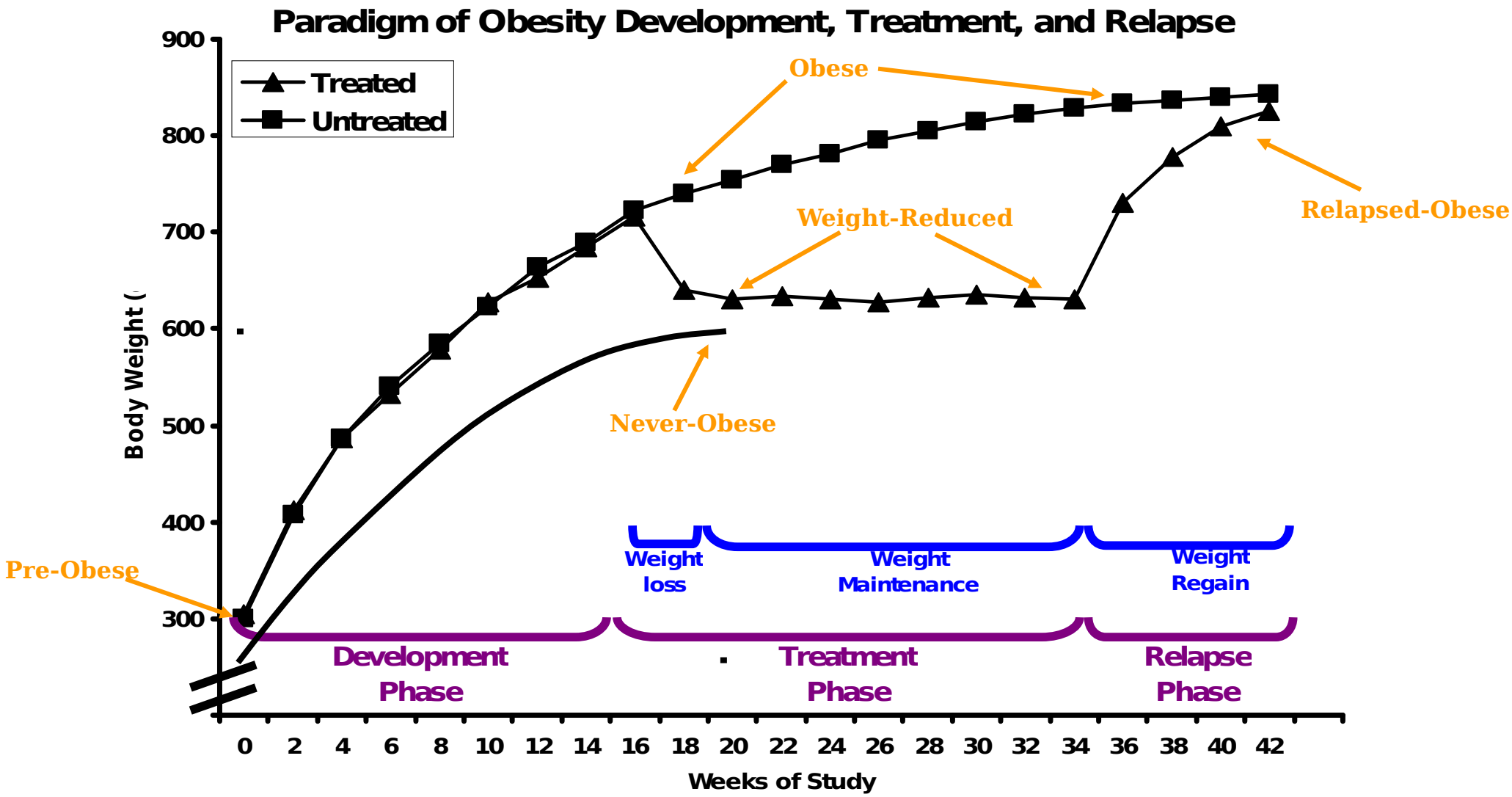
- More recent weight loss
- Larger weight loss
- Higher levels of depression
- Higher levels of disinhibition or binge eating
- 2-5 years out decreased the risk of regain by 50%
- Gainers: Increased fat intake; decreased physical activity; decreases in dietary restraint, more TV watching


30
25
20
15
10
5
0
% of the NWCR
28.2
26.2
25.2
10.6
7.9
1.4
0.4
National Average
28 hr/wk
0-1
2-5
6-10
11-20
21-40
41-60
>=61
Hr/wk of TV watching


Weight gain (kg)
4
3.5
3
2.5
2
1.5
1
0.5
0
Upper
Middle
Lower
Tertile change in percentage of calories from fat
Increase
Maintain
Decrease
Change in TV viewing category

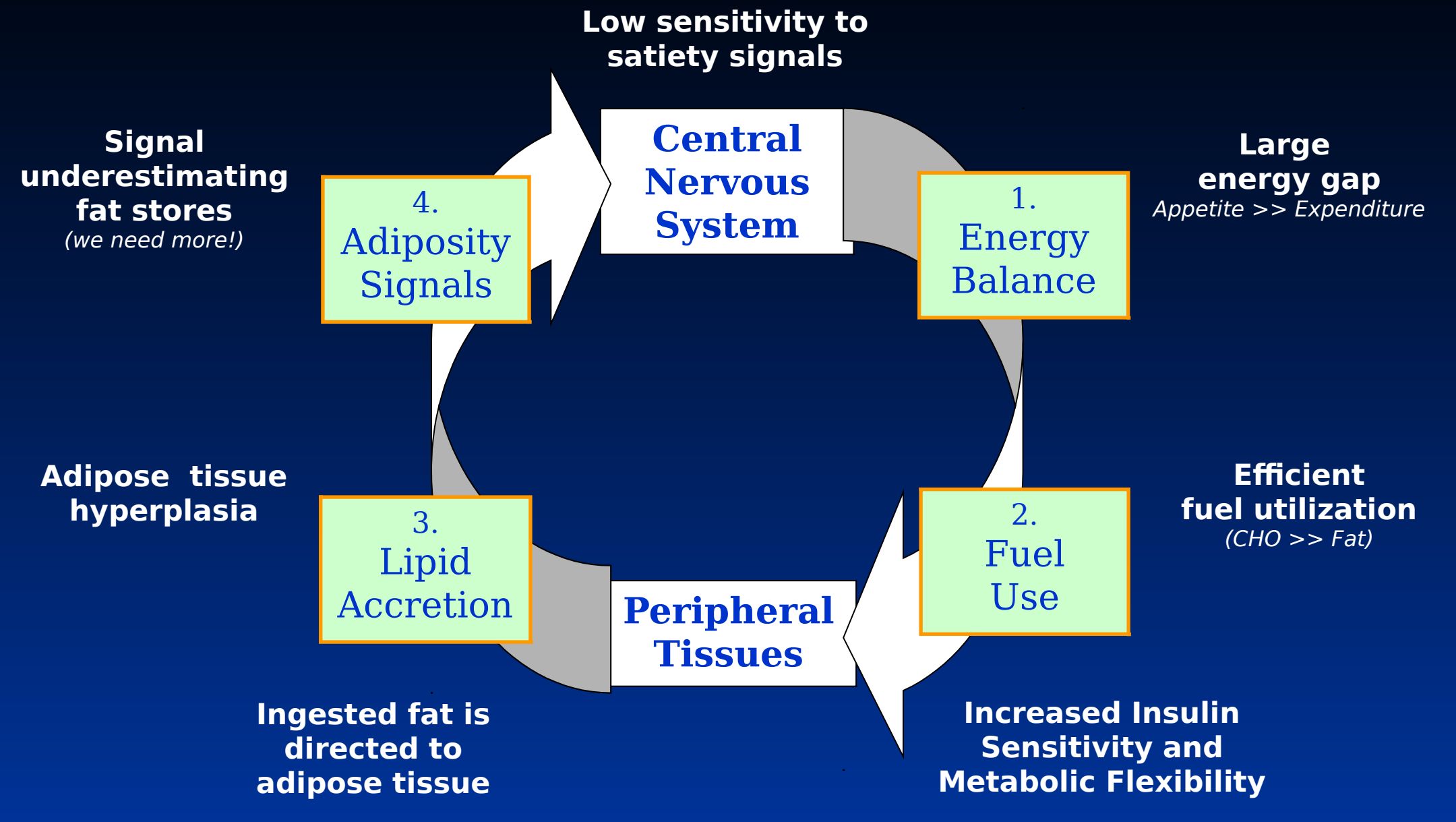
Why is maintaining a weight loss so difficult?

- Metabolic changes associated with a weight loss
- Can’t maintain behaviors long-term
- Combination

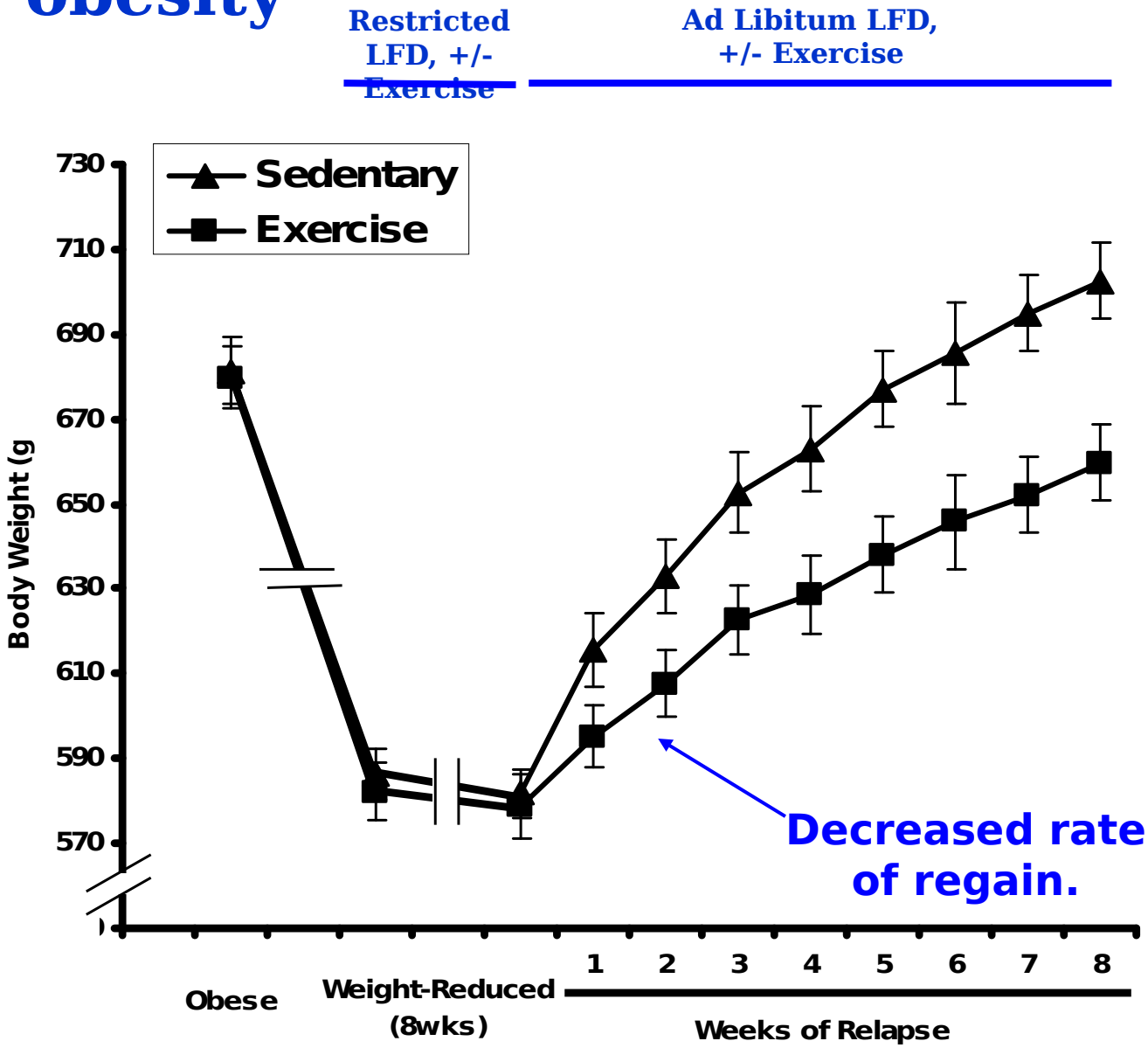


Development Phase = high fat diet, limited activity
Treatment Phase = can vary; usually a low fat energy restricted diet
Relapse phase = can vary; usually ad libitum feeding under treatment phase conditions

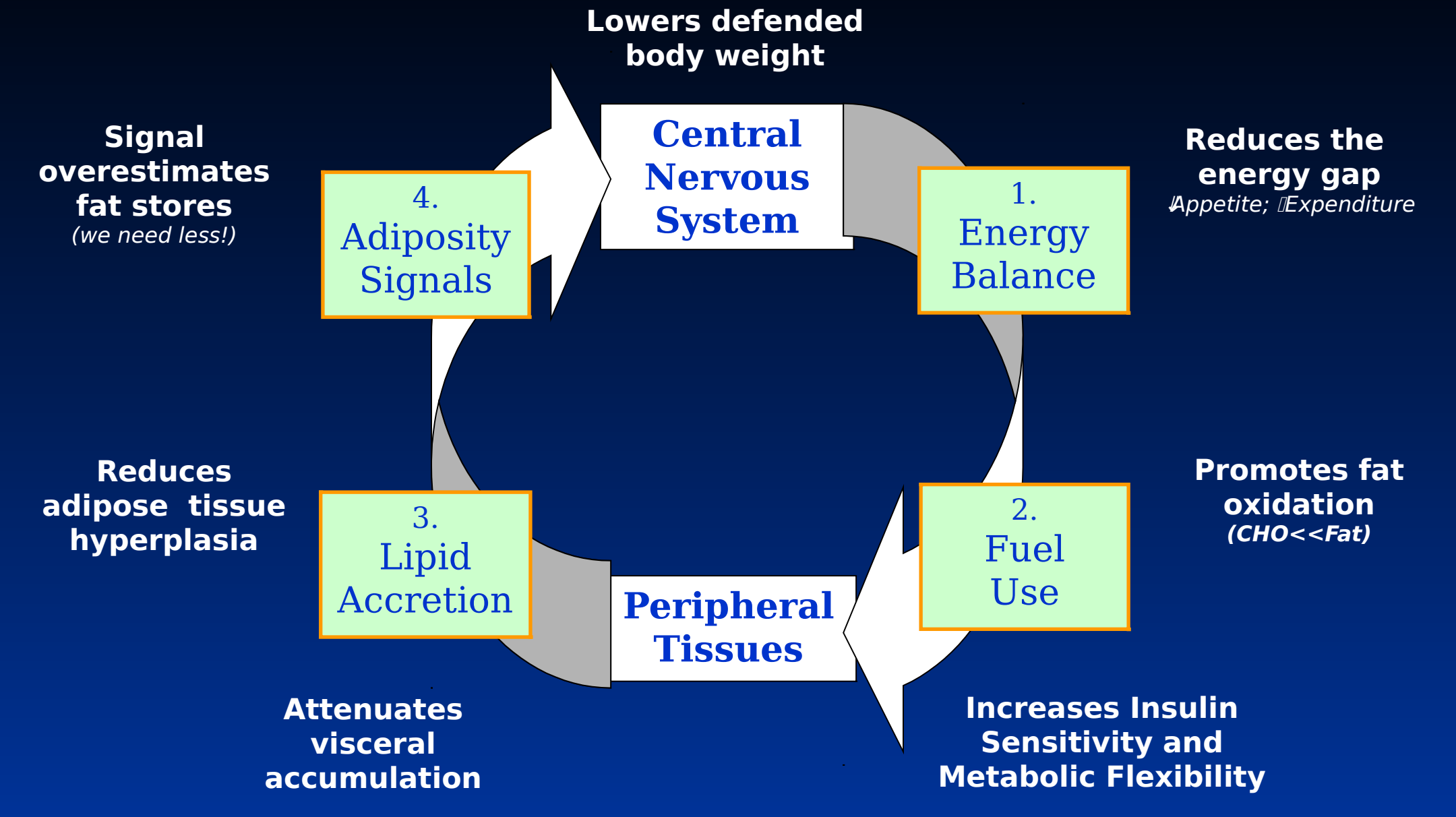
Metabolic Adaptations to Weight Reduction that Promote Weight Regain



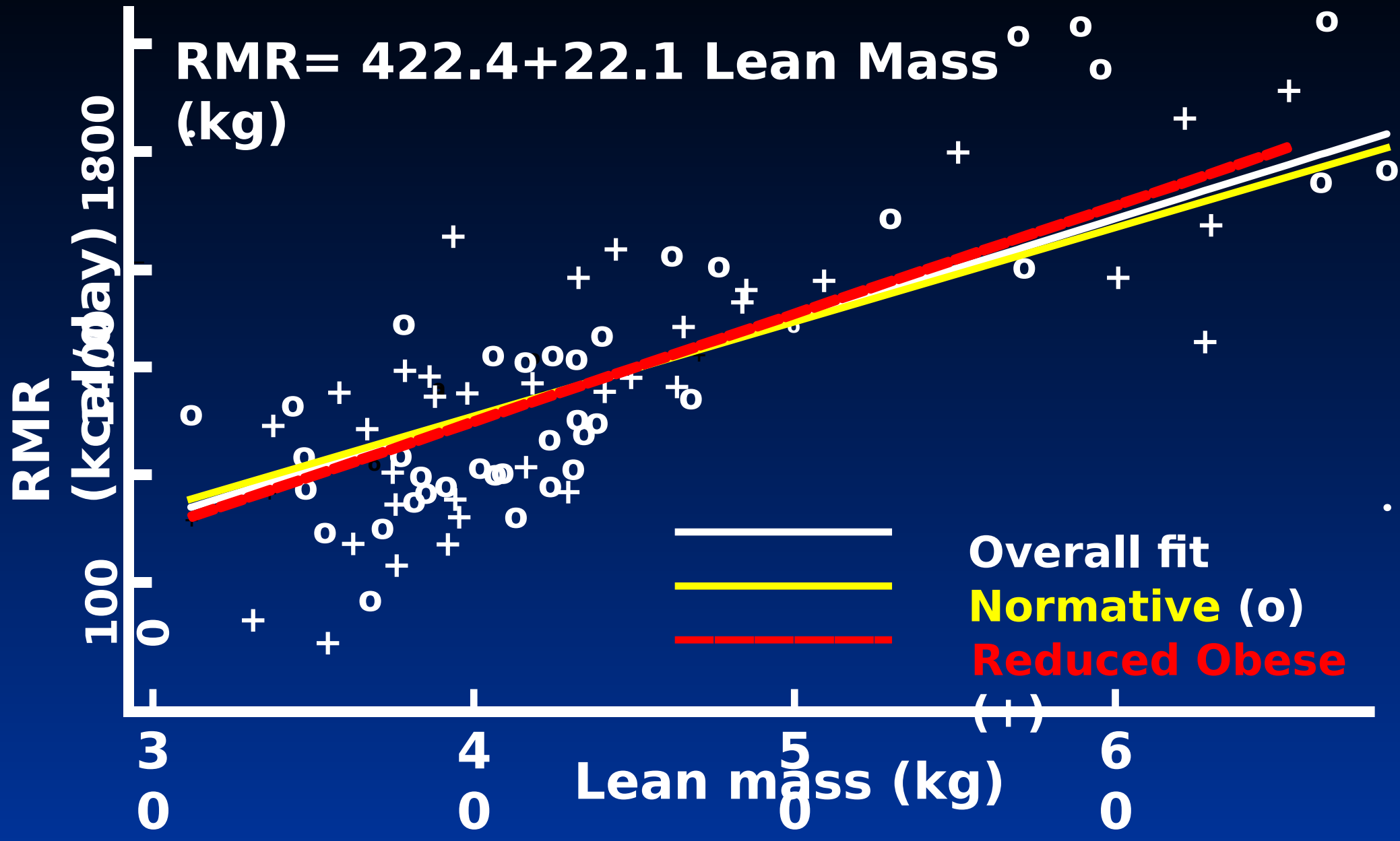
Effects of daily exercise on the relapse to obesity



Exercise Reduces the Metabolic Drive to Regain Weight



RMR vs Lean Mass



Bell, Melby, Seals et al.

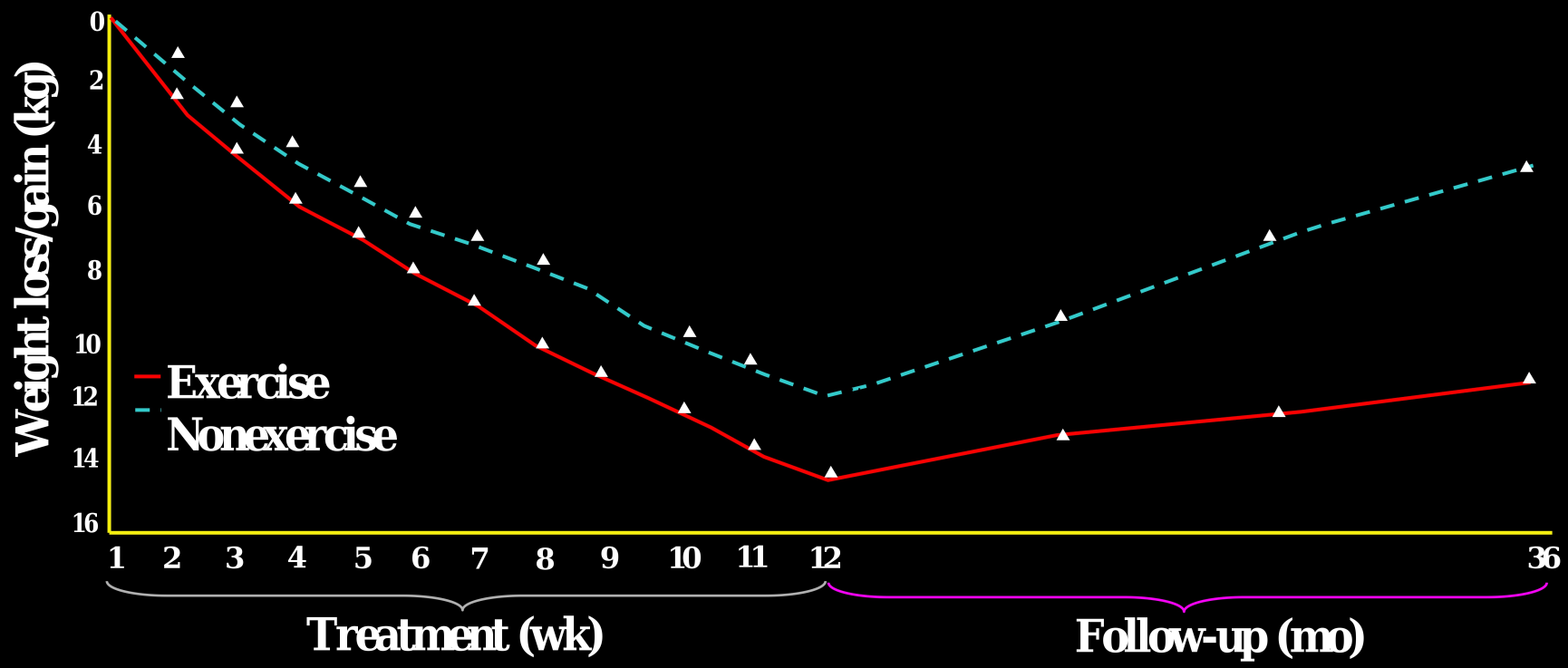
Does Exercise Increase RMR?

RMR in Trained vs Untrained Subjects

- **When trained subjects were measured afte**
days of not exercising - no difference in RM

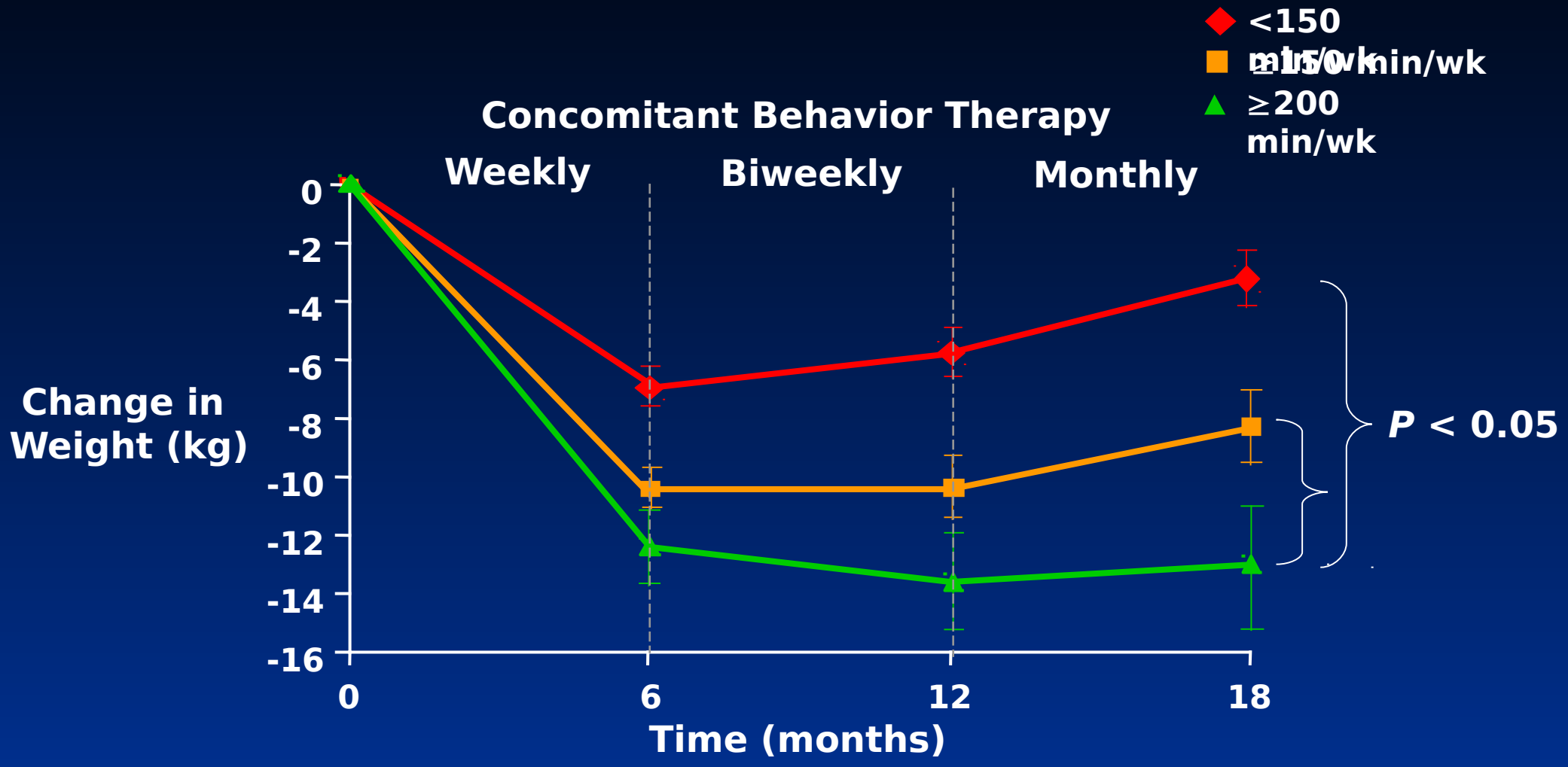
- **When trained subjects were measured wit**
stopping usual exercise routine – RMR high

Weight Loss Maintenance– What Works?



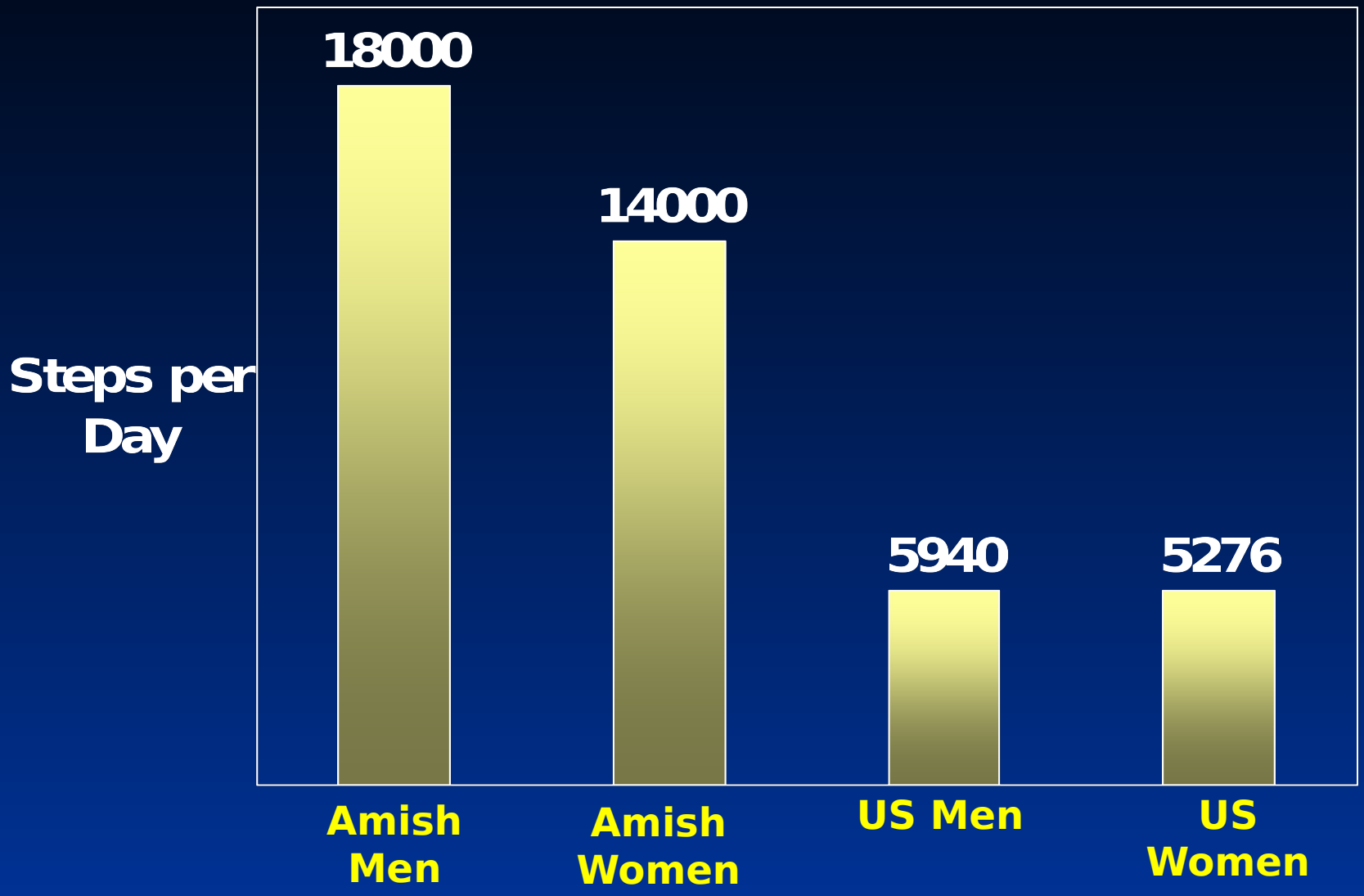
Adapted from Pavlou KN, et al. *Am J Clin Nutr*. 1989;49:1115-1123.

Considerable Physical Activity Is Necessary for Weight Loss Maintenance



Jakicic et al. *JAMA.* 1999;282:1554.

Walking: Old Order Amish vs. Current Population

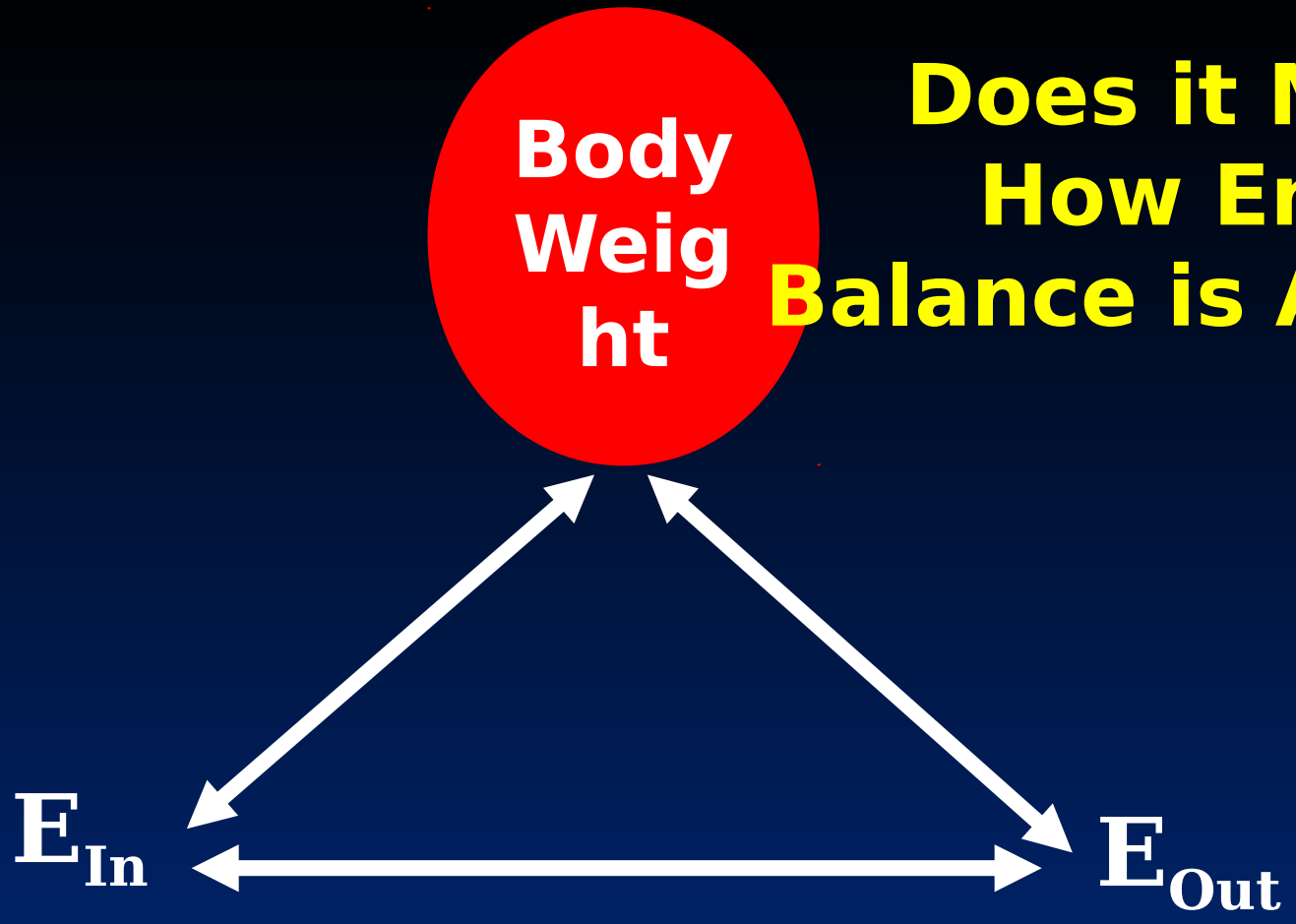


Physical Activity and Weight Management

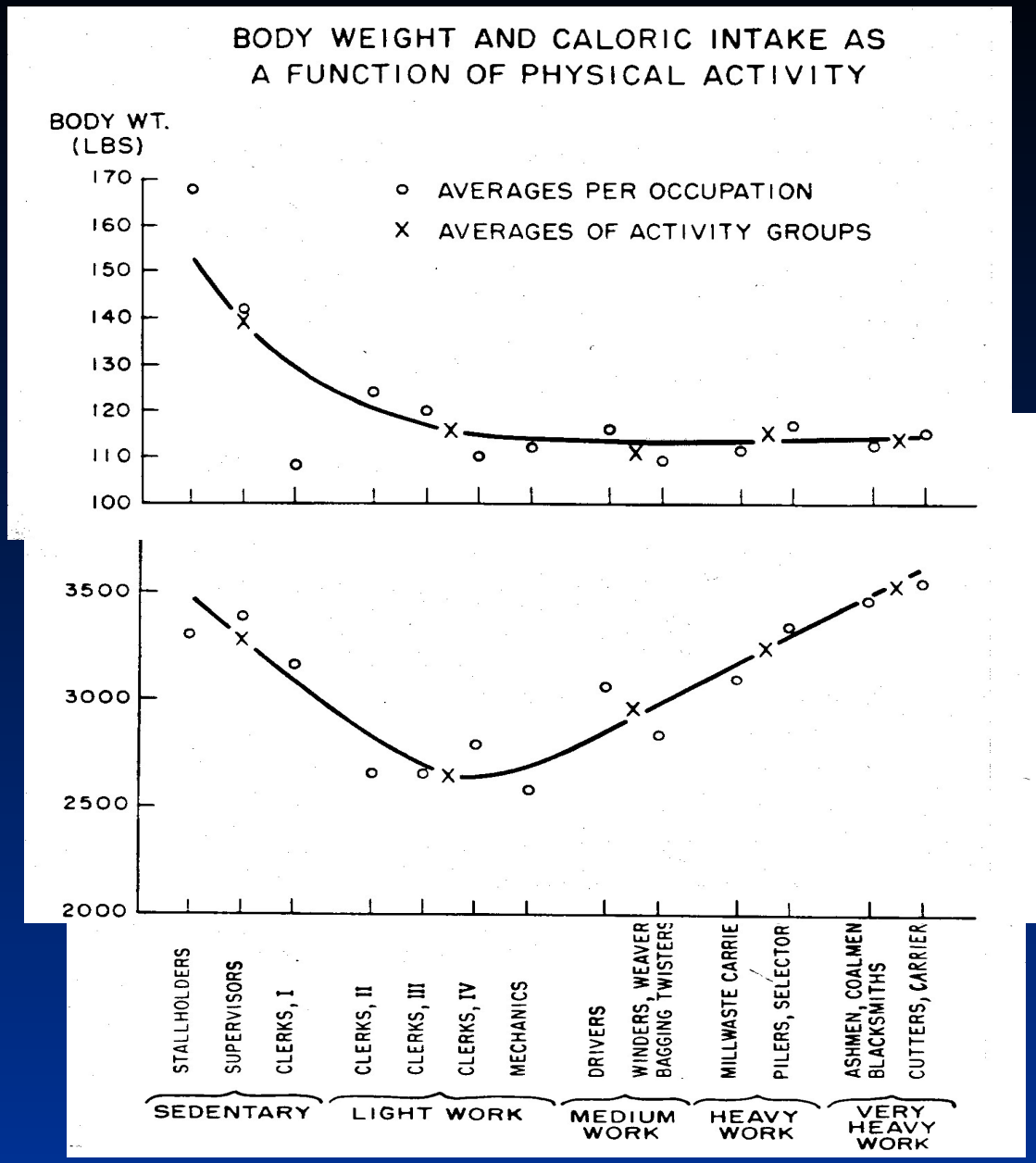
Physical activity is the best predictor of weight maintenance?

- **Why: More calories burned; Something else?**

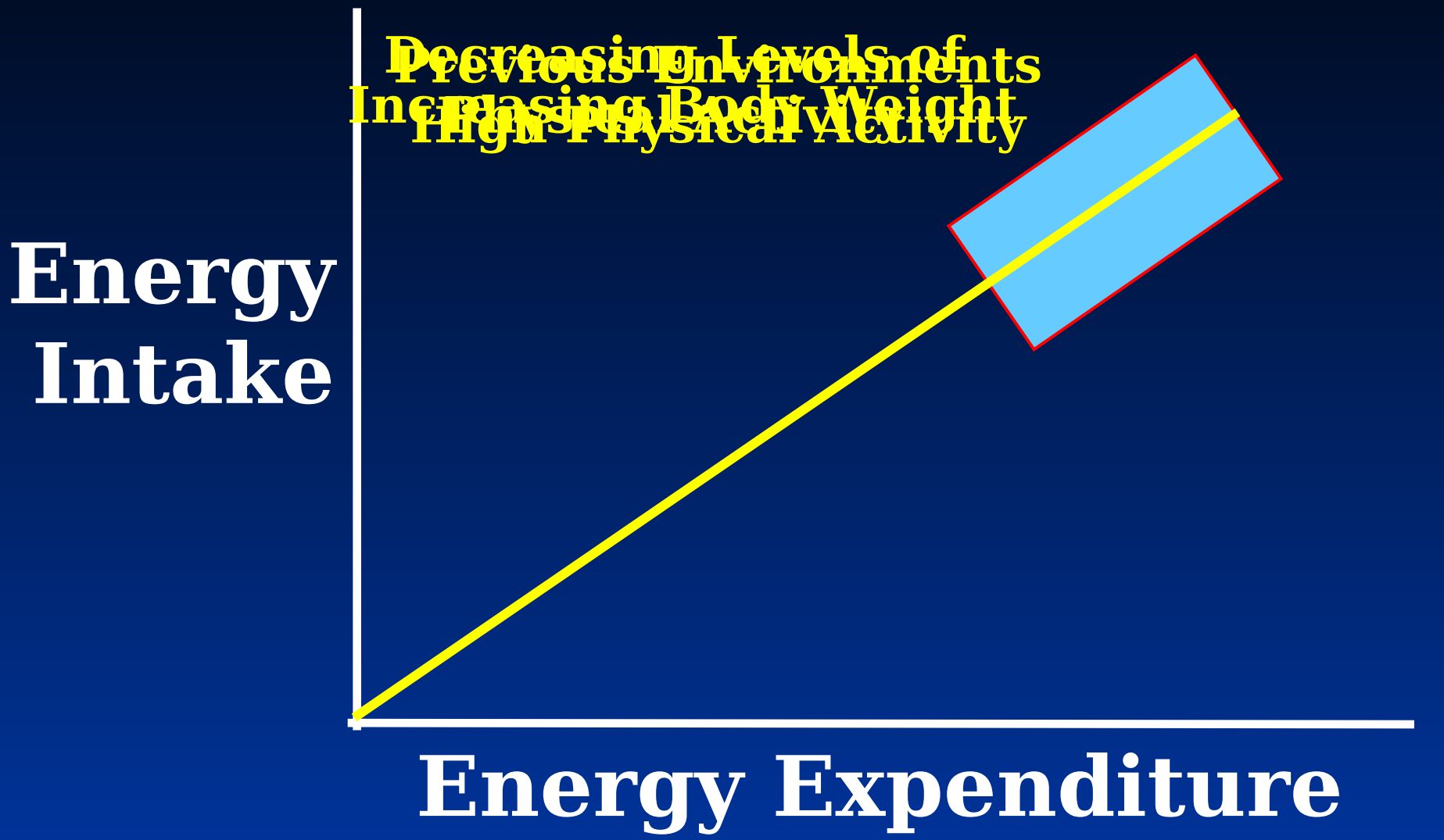
Does it Matter How Energy Balance is Achieved?



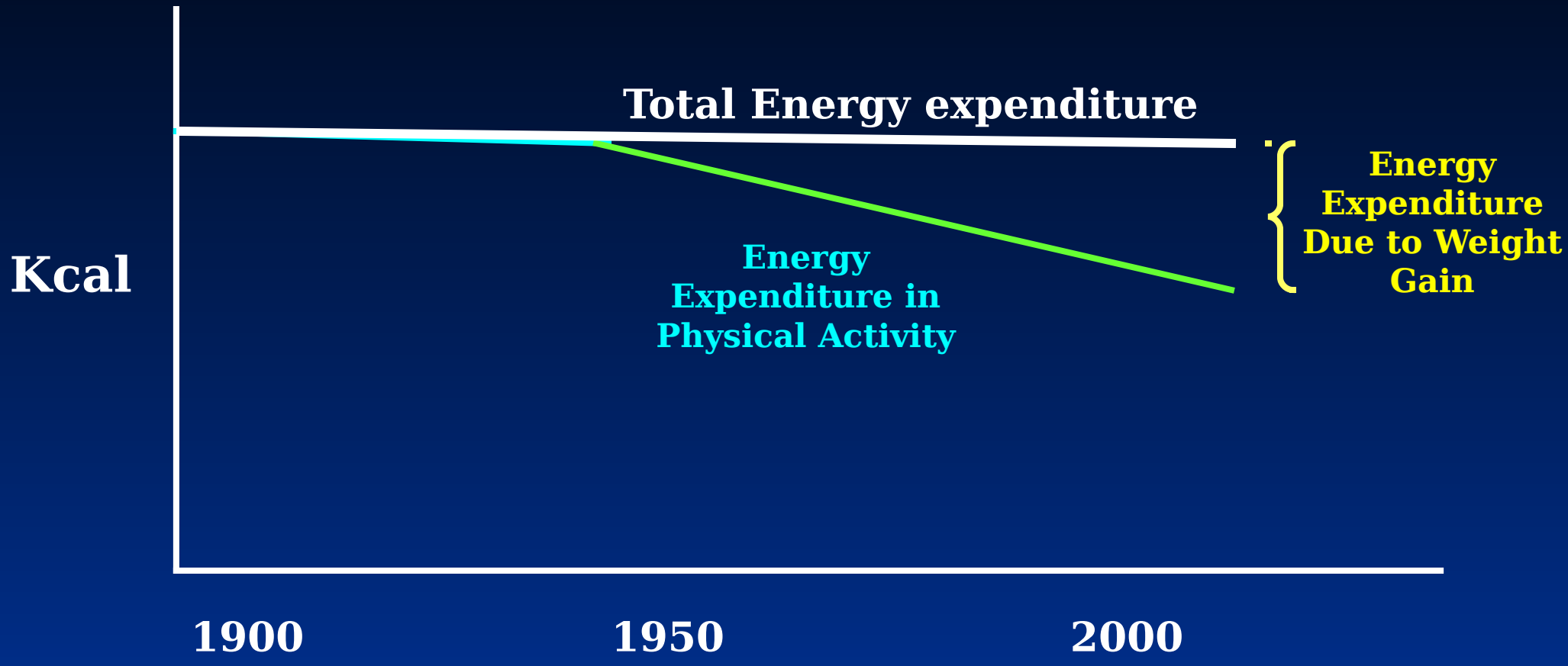
E_{In}	E_{Out}
1500	1500
2000	2000
2500	2500


BODY WEIGHT AND CALORIC INTAKE AS
A FUNCTION OF PHYSICAL ACTIVITY
BODY WT.
(LBS)
170
160
150
140
130
120
110
100
AVERAGES PER OCCUPATION
AVERAGES OF ACTIVITY GROUPS
3500
3000
2500
2000
STALLHOLDERS
SUPERVISORS
CLERKS, I
CLERKS, II
CLERKS, III
CLERKS, IV
MECHANICS
DRIVERS
WINDERS, WEAVER
BAGGING TWISTERS
MILLWASTE CARRIE
PILERS, SELECTOR
ASHMEN, COALMEN
BLACKSMITHS
CUTTERS, CARRIER
SEDENTARY
LIGHT WORK
MEDIUM WORK
HEAVY WORK
VERY HEAVY WORK

Energy Balance Regulation is Best Achieved at High Levels of
ergy Expenditure (High Energy Flux or High Energy Through



Hypothetical Model for the Cause of the Obesity Epidemic of the Late 20th Century

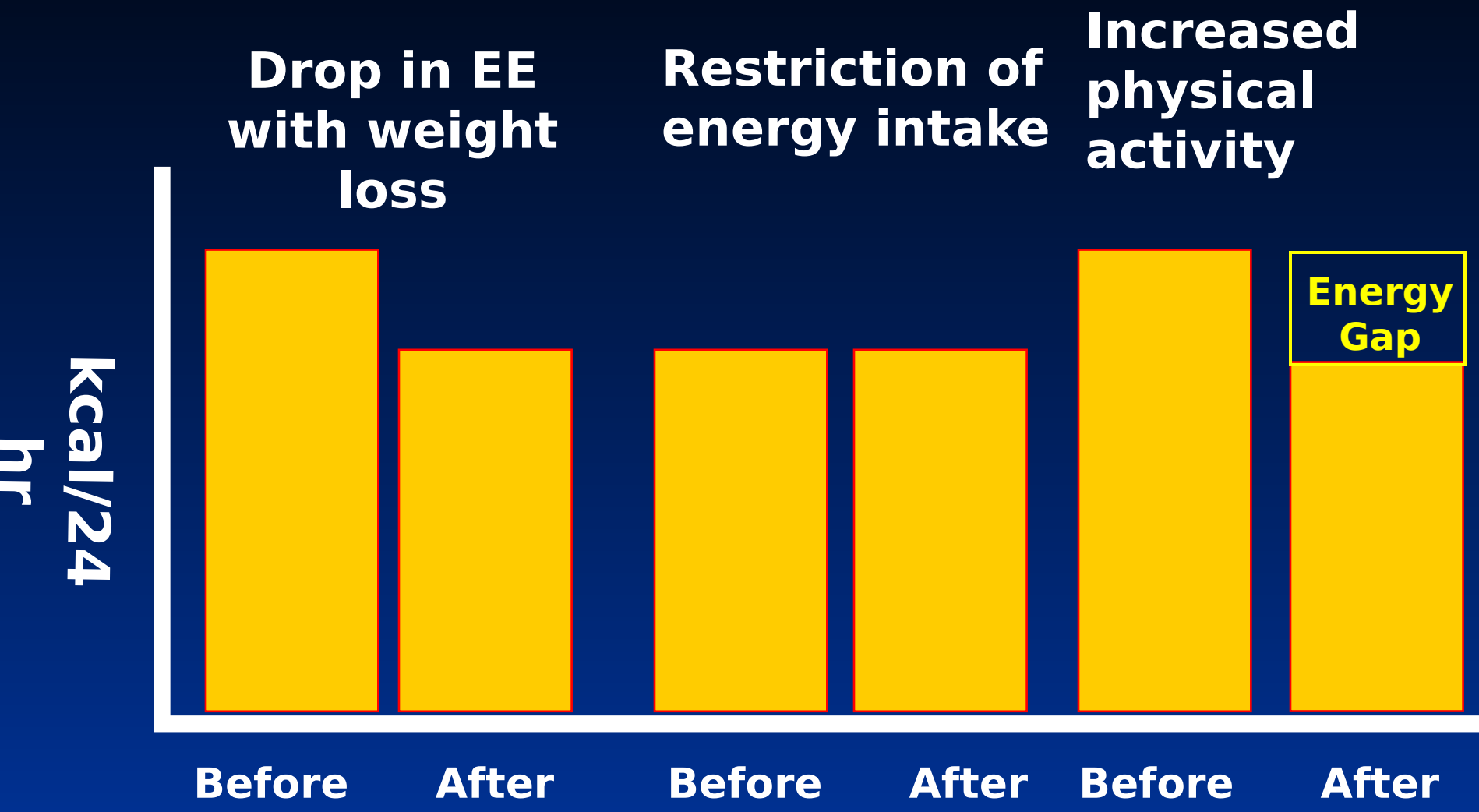


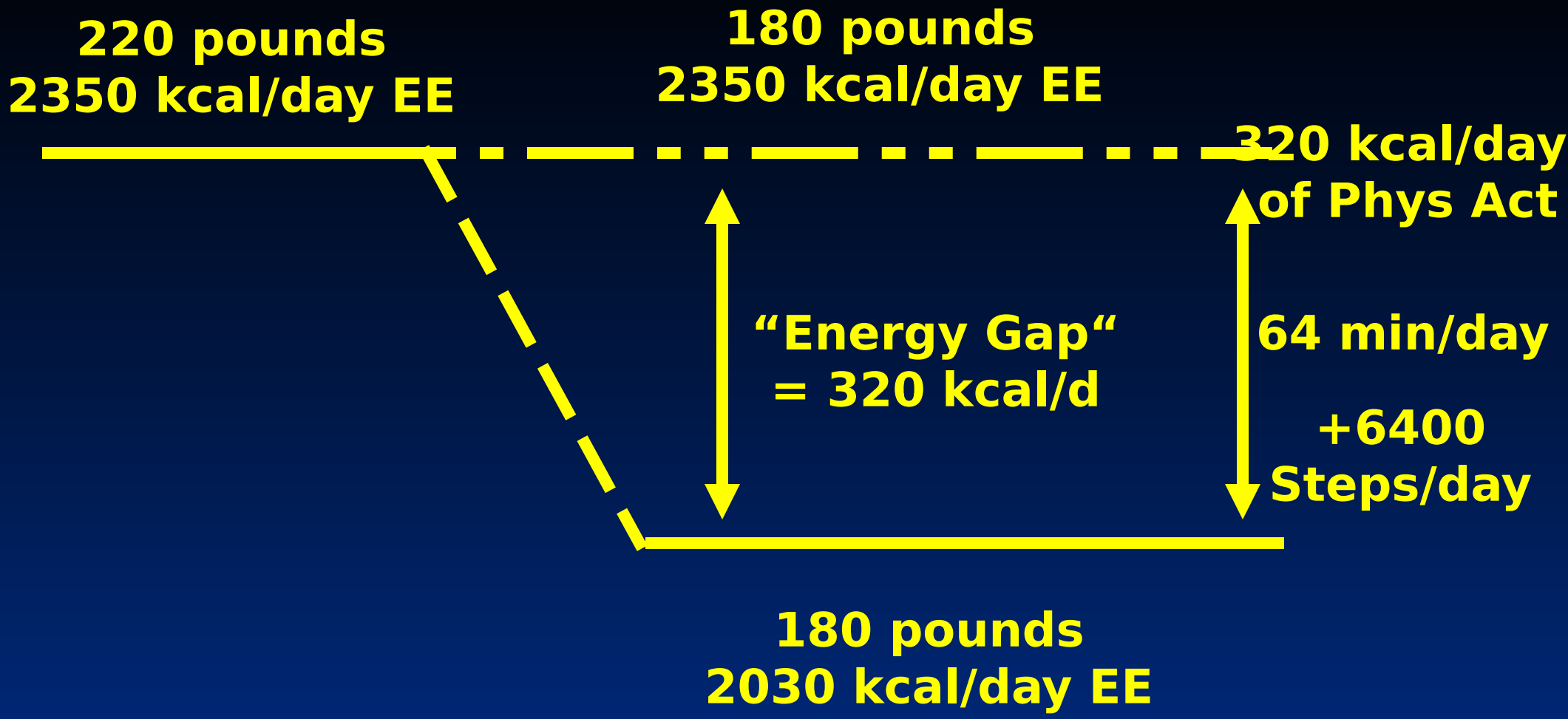
How Much Physical Activity is Required to Prevent Weight Regain?

The “Energy Gap”

- **Total energy expenditure declines with weight loss – proportional to amount of weight lost**
- **Challenge in keeping weight off is to deal with this reduction in energy expenditure or filling this energy gap**

The Energy Gap



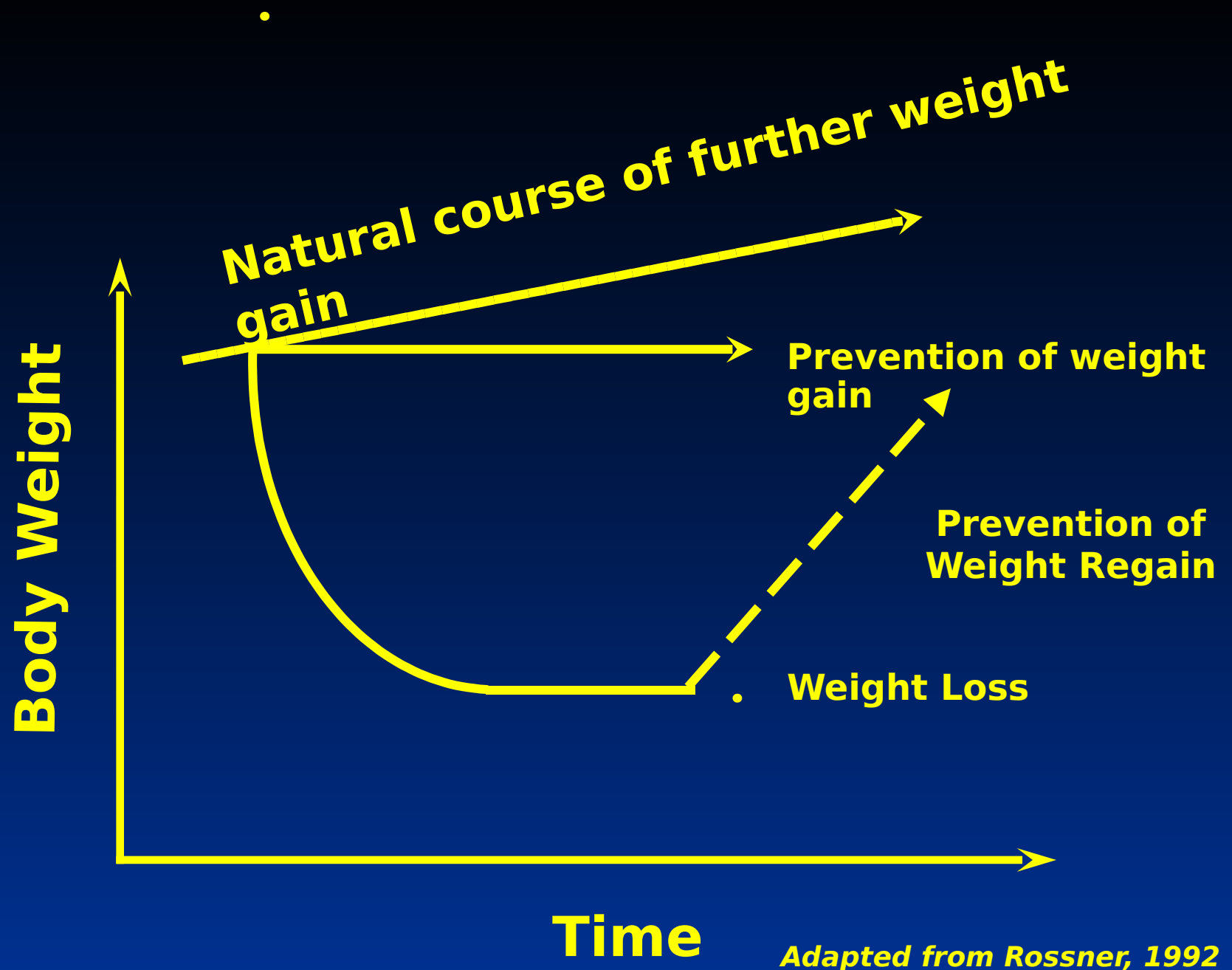

220 pounds
2350 kcal/day EE
180 pounds
2350 kcal/day EE
320 kcal/day
of Phys Act
“Energy Gap“
= 320 kcal/d
64 min/day
+6400
Steps/day
180 pounds
2030 kcal/day EE

NWCR: Weight Loss and Maintenance Strategies

- Great similarity in how weight is being maintained
  - Low fat diet but watching total calories
  - Frequent self monitoring
  - Regularly eating breakfast
  - High daily levels of physical activity

NWCR

- What do they do?
- How do they do it?



Adapted from Rossner, 1992

Program of the America On the Move Foundation
www.americaonthemove.org

1-800-606-NWCR

www.nwcr.ws